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Interactive comment on “Inundation and groundwater dynamics for quantification of evaporative water loss in tropical wetlands” by J. Schwerdtfeger et al.

Anonymous Referee #1

Received and published: 15 April 2014

General comment: The paper clearly and concisely documents methods for correcting several potential PET equations to actual AET, based on “extinction depth” (water distance below land surface) concepts for a tropical wetland (Pantanal) in South America. I admire the analysis in the paper...the results and conclusions are clear, concise, and well-structured. In my opinion, however, the manuscript does not represent a substantial contribution to the ET science, nor does it present new concepts, ideas and methodology. PET equations are commonly limited to AET using extinction depth / water availability functions (see Harbaugh 2005; ET models in German 2000; Shoemaker and Sumner 2006). The data and results generated by the analysis could qualify as

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novel and new, as they reveal subtropical wetland PET and AET rates, as well as discovery of the Turc equation as the best estimator. However, the methods employed to compute results and draw conclusions are not entirely valid, in my view, as I'll attempt to explain in more detail.

The paper uses pan ET rates as the “truth”, or closest approximation to PET. The pan locations are not clearly labeled on Figure 1, and some meteorological conditions surrounding the pans do not resemble meteorological conditions in the wetland study area. Specifically, Section 4.1 states R2's between meteorological conditions at the pans and study area “were 0.55, 0.84 and 0.38” for Ta, RH and v; respectively, on a mean monthly basis. Pan RH is similar to your study area; however, Ta and v are different. Furthermore, R2's would likely decrease for each of these variables at weekly and daily time scales. I am convinced the corrected PET equations are a good estimate for pan evaporation limited by water depth below land surface. I am not convinced the corrected PET equations represent subtropical wetland PET and AET for water bodies (Figure 1c) in the Pantanal, given the supporting documentation and statistics (monthly R2) in the analysis.

Consider calibrating the PET equations to Bowen ratio AET estimates. The Bowen ratio station is at water body C (Table 3) in the Pantanal, according to the manuscript. Calibration could cover both “first and second stage (dry)” evaporation since the PET equations will differ from Bowen ratio AET not only when the sites are dry but also flooded. Novel corrections could be derived based on air temperature, VPD, RH, etc. . .and compared to the commonly applied “extinction depth” correction. Furthermore, resulting ET estimates will be more reliable given the location of the Bowen ratio station in wetland water body C. I suspect you can achieve your goal of deriving a “first and second stage” ET estimator for Pantanal wetlands with limited data requirements, using this modified strategy.

Specific comments: Use active voice when writing. The paper needs a global edit to address this issue. For example, the first sentence in the Abstract could be rewritten

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as “Characterizing hydrologic processes within tropical wetlands is challenging due to their remoteness, complexity and heterogeneity.”

Abstract Line 10: I disagree with the statement that “As yet, no adequate method exists for determining second stage evaporation without soil moisture data, which are usually unavailable for remote tropical wetlands.” A similar statement is made on lines 22 and 23 in the Introduction. German (2000) and Shoemaker and Sumner (2006) both present several PET corrections/models that were adequate for estimating first and second stage AET, while not requiring soil moisture data.

References cited in this comment:

Harbaugh, A.W., 2005, MODFLOW-2005, the U.S. Geological Survey modular ground-water model – the Ground-Water Flow Process: U.S. Geological Survey Techniques and Methods 6-A16.

German, E. R. 2000. Regional evaluation of evapotranspiration in the Everglades. U.S. Geological Survey Water Resources Investigations Report 00-4217.

Shoemaker WB, Sumner DM. 2006. Alternate corrections for estimating actual wetland evapotranspiration from potential evapotranspiration. *Wetlands* 26: 528–543

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, 11, 4017, 2014.

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11, C938–C940, 2014

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